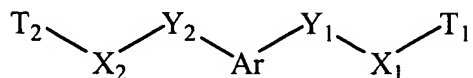


CLAIMS

What is claimed is:

1. An organophotoreceptor comprising an electrically conductive substrate and a photoconductive element on the electrically conductive substrate, the photoconductive element comprising:

(a) a charge transport material having the formula



where Y₁ and Y₂ are, each independently, a bond, -CR₁=N-NR₂-, or -CR₃=N-N=CR₄- where R₁, R₂, R₃, and R₄ comprise, each independently, H, an alkyl group, an alkenyl group, a heterocyclic group, or an aromatic group;

X₁ and X₂ are, each independently, a linking group having the formula -(CH₂)_m-, branched or linear, where m is an integer between 0 and 20, inclusive, and one or more of the methylene groups is optionally replaced by O, S, C=O, O=S=O, a heterocyclic group, an aromatic group, urethane, urea, an ester group, an NR₅ group, a CHR₆ group, or a CR₇R₈ group where R₅, R₆, R₇, and R₈ comprise, each independently, H, hydroxyl group, thiol group, an alkyl group, an alkenyl group, a heterocyclic group, or an aromatic group;

T₁ and T₂ are, each independently, a thiiranyl group, H, an alkyl group, an alkenyl group, or an aromatic group with the proviso that at least one of T₁ and T₂ is a thiiranyl group; and

Ar comprises an aromatic group with the proviso that when both Y₁ and Y₂ are a bond and one of T₁ and T₂ is not a thiiranyl group, Ar comprises a bis[(N,N-disubstituted)amino]aromatic group or a bicarbazole group; and

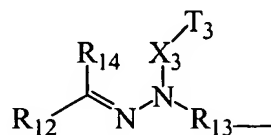
(b) a charge generating compound.

2. An organophotoreceptor according to claim 1 wherein T₂ is H, the m value for X₂ is 0, Y₂ is a bond, Y₁ is -CR₁=N-NR₂- where the C atom is connected to Ar and the terminal N atom is connected to X₁, and T₁ comprises a thiiranyl group.

3. An organophotoreceptor according to claim 2 wherein Ar comprises an arylamine group or an aromatic heterocyclic group.

4. An organophotoreceptor according to claim 2 wherein R₂ comprises an aromatic group.

5. An organophotoreceptor according to claim 4 wherein the aromatic group of R₂ has the formula



where R₁₂ comprises an arylamine group, R₁₃ is a linking group comprising an alkyl group, an alkenyl group, or an aryl group, R₁₄ comprises H, an alkyl group, an alkenyl group, or an aryl group, X₃ has the formula -(CH₂)_m-, branched or linear, where m is an integer between 1 and 20, and T₃ is a thiiranyl group.

6. An organophotoreceptor according to claim 1 wherein the m value for X₁ is 0, T₁ comprises an aromatic group, T₂ comprises a thiiranyl group, Y₂ is a bond, and Y₁ is -CR₁=N-NR₂- where the C atom is connected to Ar and the terminal N atom is connected directly to T₁.

7. An organophotoreceptor according to claim 6 wherein Ar comprises an arylamine group or an aromatic heterocyclic group.

8. An organophotoreceptor according to claim 1 wherein T₂ is H, the m value for X₂ is 0, Y₂ is a bond, Y₁ is -CR₃=N-N=CR₄-, and T₁ comprises a thiiranyl group.

9. An organophotoreceptor according to claim 8 wherein Ar comprises an arylamine group or an aromatic heterocyclic group.

10. An organophotoreceptor according to claim 1 wherein Y₁ and Y₂ are a bond and Ar comprises a bis[(N,N-disubstituted)amino]arylene group.

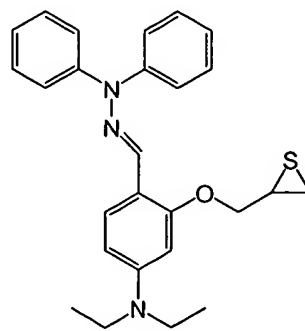
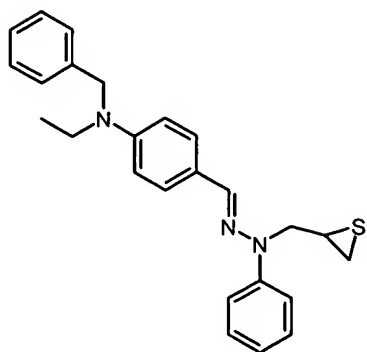
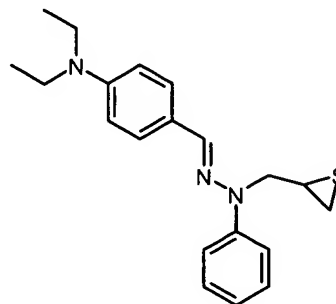
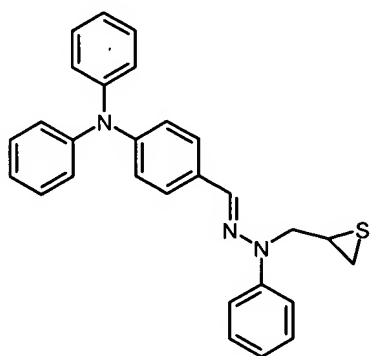
11. An organophotoreceptor according to claim 10 wherein T₂ is H, an alkyl group, an alkenyl group, or an aromatic group.

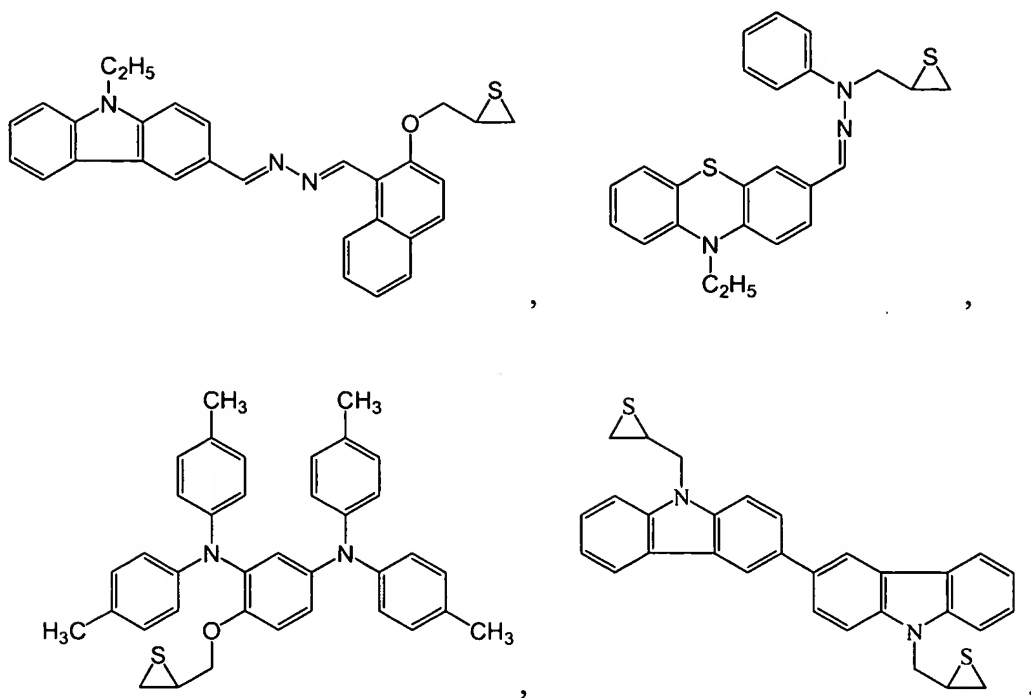
12. An organophotoreceptor according to claim 1 wherein Y₁ and Y₂ are a
5 bond, Ar comprises two arylamine groups.

13. An organophotoreceptor according to claim 12 wherein Ar is a bicarbazole group.

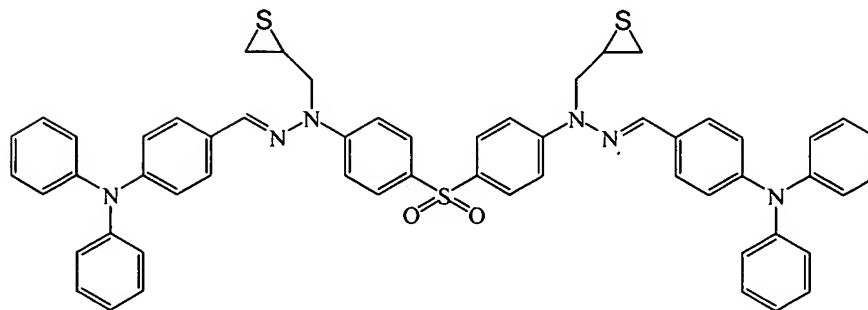
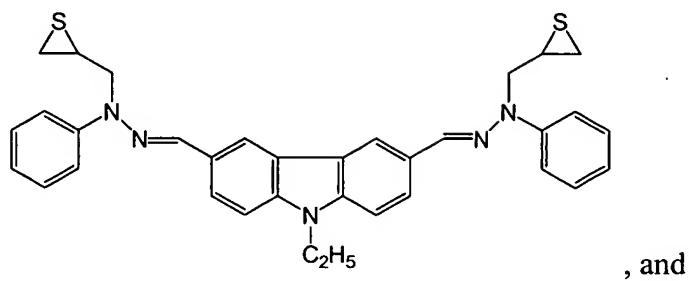
10 14. An organophotoreceptor according to claim 1 wherein Ar comprises an arylamine group, Y₁ and Y₂ are each independently -CR₁=N-NR₂-, and T₁ and T₂, each independently, comprise a thiiranyl group.

15 15. An organophotoreceptor according to claim 1 wherein the charge transport material is selected from the group consisting of the following formulae:





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16. An organophotoreceptor according to claim 1 wherein the photoconductive element further comprises a second charge transport material.

17. An organophotoreceptor according to claim 16 wherein the second charge transport material comprises an electron transport compound.

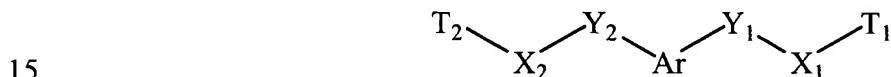
5 18. An organophotoreceptor according to claim 1 wherein the photoconductive element further comprises a binder.

19. An electrophotographic imaging apparatus comprising:

(a) a light imaging component; and

10 (b) an organophotoreceptor oriented to receive light from the light imaging component, the organophotoreceptor comprising an electrically conductive substrate and a photoconductive element on the electrically conductive substrate, the photoconductive element comprising:

(i) a charge transport material having the formula



where Y_1 and Y_2 are, each independently, a bond, $-CR_1=N-NR_2-$, or $-CR_3=N-N=CR_4-$ where R_1 , R_2 , R_3 , and R_4 comprise, each independently, H, an alkyl group, an alkenyl group, a heterocyclic group, or an aromatic group;

X_1 and X_2 are, each independently, a linking group having the formula $-(CH_2)_m-$,
20 branched or linear, where m is an integer between 0 and 20, inclusive, and one or more of the methylene groups is optionally replaced by O, S, C=O, O=S=O, a heterocyclic group, an aromatic group, urethane, urea, an ester group, an NR_5 group, a CHR_6 group, or a CR_7R_8 group where R_5 , R_6 , R_7 , and R_8 comprise, each independently, H, hydroxyl group, thiol group, an alkyl group, an alkenyl group, a heterocyclic group, or an aromatic group;

25 T_1 and T_2 are, each independently, a thiiranyl group, H, an alkyl group, an alkenyl group, or an aromatic group with the proviso that at least one of T_1 and T_2 is a thiiranyl group; and

Ar comprises an aromatic group with the proviso that when both Y_1 and Y_2 are a bond and one of T_1 and T_2 is not a thiiranyl group, Ar comprises a bis[(N,N-disubstituted)amino]aromatic group or a bicarbazole group; and
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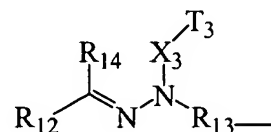
(ii) a charge generating compound.

20. An electrophotographic imaging apparatus according to claim 19 wherein T_2 is H, the m value for X_2 is 0, Y_2 is a bond, Y_1 is $-CR_1=N-NR_2-$ where the C atom is
5 connected to Ar and the terminal N atom is connected to X_1 , and T_1 comprises a thiiranyl group.

21. An electrophotographic imaging apparatus according to claim 20 wherein Ar comprises an arylamine group or an aromatic heterocyclic group.

22. An electrophotographic imaging apparatus according to claim 20 wherein R_2 comprises an aromatic group.

23. An electrophotographic imaging apparatus according to claim 22 wherein
15 the aromatic group of R_2 has the formula



where R_{12} comprises an arylamine group, R_{13} is a linking group comprising an alkyl group, an alkenyl group, or an aryl group, R_{14} comprises H, an alkyl group, an alkenyl group, or an aryl group, X_3 has the formula $-(CH_2)_m-$, branched or linear, where
20 m is an integer between 1 and 20, and T_3 is a thiiranyl group.

24. An electrophotographic imaging apparatus according to claim 19 wherein the m value for X_1 is 0, T_1 comprises an aromatic group, T_2 comprises a thiiranyl group, Y_2 is a bond, and Y_1 is $-CR_1=N-NR_2-$ where the C atom is connected to Ar and the
25 terminal N atom is connected directly to T_1 .

25. An electrophotographic imaging apparatus according to claim 24 wherein Ar comprises an arylamine group or an aromatic heterocyclic group.

26. An electrophotographic imaging apparatus according to claim 19 wherein T_2 is H, the m value for X_2 is 0, Y_2 is a bond, Y_1 is $-CR_3=N-N=CR_4-$, and T_1 comprises a thiiranyl group.

5 27. An organophotoreceptor according to claim 26 wherein Ar comprises an arylamine group or an aromatic heterocyclic group.

28. An electrophotographic imaging apparatus according to claim 19 wherein Y_1 and Y_2 are a bond and Ar comprises a bis[(N,N-disubstituted)amino]arylene group.

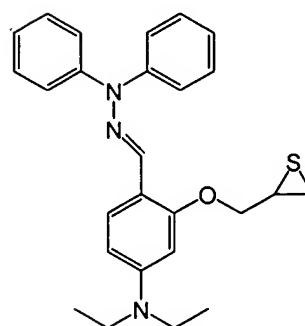
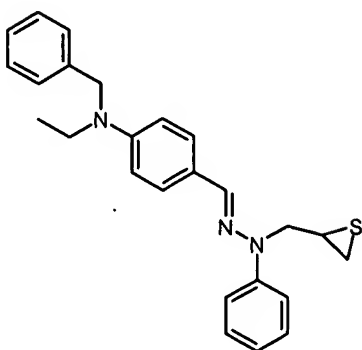
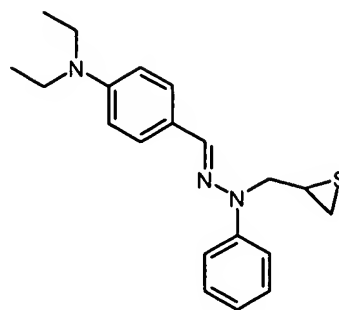
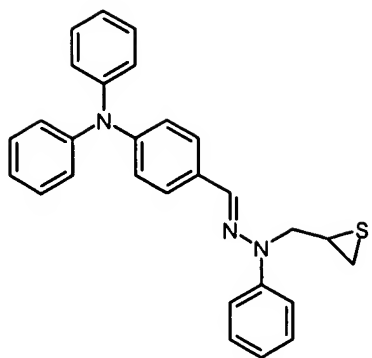
10 29. An electrophotographic imaging apparatus according to claim 28 wherein T_2 is H, an alkyl group, an alkenyl group, or an aromatic group.

30. An electrophotographic imaging apparatus according to claim 19 wherein
15 Y_1 and Y_2 are a bond, Ar comprises two arylamine groups.

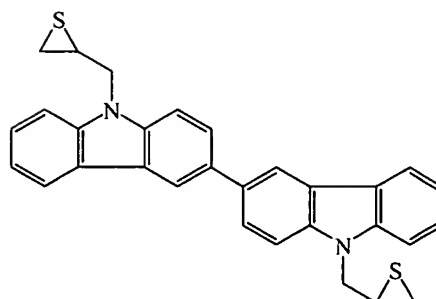
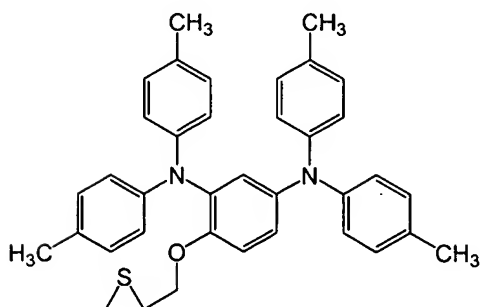
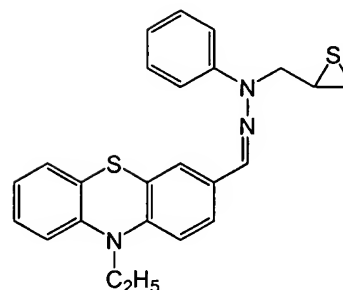
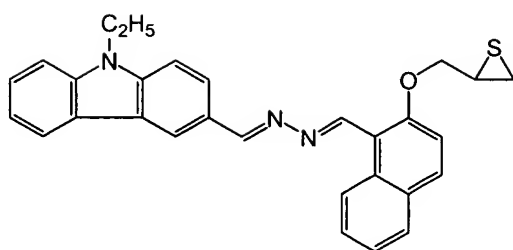
31. An organophotoreceptor according to claim 30 wherein Ar is a bicarbazole group.

20 32. An electrophotographic imaging apparatus according to claim 19 wherein Ar comprises an arylamine group, Y_1 and Y_2 are each independently $-CR_1=N-NR_2-$, and T_1 and T_2 , each independently, comprise a thiiranyl group.

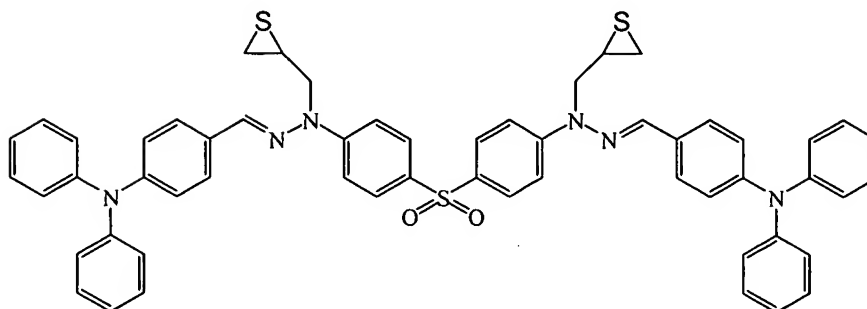
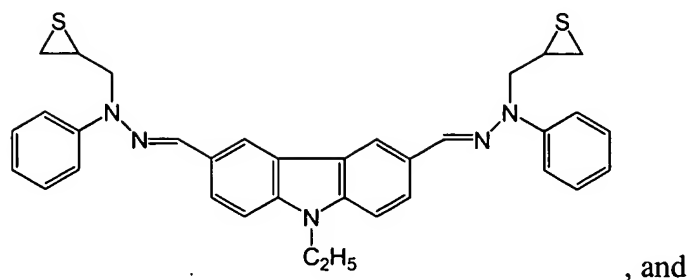
25 33. An electrophotographic imaging apparatus according to claim 19 wherein the charge transport material is selected from the group consisting of the following formulae:



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34. An electrophotographic imaging apparatus according to claim 19 wherein the photoconductive element further comprises a second charge transport material.

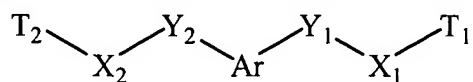
35. An electrophotographic imaging apparatus according to claim 34 wherein
10 second charge transport material comprises an electron transport compound.

36. An electrophotographic imaging apparatus according to claim 19 further comprising a liquid toner dispenser.

15 37. An electrophotographic imaging process comprising;

(a) applying an electrical charge to a surface of an organophotoreceptor comprising an electrically conductive substrate and a photoconductive element on the electrically conductive substrate, the photoconductive element comprising

(i) a charge transport material having the formula



20

where Y_1 and Y_2 are, each independently, a bond, $-CR_1=N-NR_2-$, or $-CR_3=N-N=CR_4-$ where R_1 , R_2 , R_3 , and R_4 comprise, each independently, H, an alkyl group, an alkenyl group, a heterocyclic group, or an aromatic group;

X_1 and X_2 are, each independently, a linking group having the formula $-(CH_2)_m-$,
 5 branched or linear, where m is an integer between 0 and 20, inclusive, and one or more of the methylene groups is optionally replaced by O, S, C=O, O=S=O, a heterocyclic group, an aromatic group, urethane, urea, an ester group, an NR_5 group, a CHR_6 group, or a CR_7R_8 group where R_5 , R_6 , R_7 , and R_8 comprise, each independently, H, hydroxyl group, thiol group, an alkyl group, an alkenyl group, a heterocyclic group, or an aromatic group;

10 T_1 and T_2 are, each independently, a thiiranyl group, H, an alkyl group, an alkenyl group, or an aromatic group with the proviso that at least one of T_1 and T_2 is a thiiranyl group; and

Ar comprises an aromatic group with the proviso that when both Y_1 and Y_2 are a bond and one of T_1 and T_2 is not a thiiranyl group, Ar comprises a bis[(N,N-disubstituted)amino]aromatic group or a bicarbazole group; and
 15

(ii) a charge generating compound.

(b) imagewise exposing the surface of the organophotoreceptor to radiation to dissipate charge in selected areas and thereby form a pattern of charged and uncharged areas on the surface;

20 (c) contacting the surface with a toner to create a toned image; and

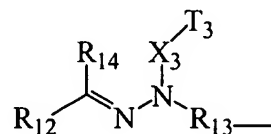
(d) transferring the toned image to substrate.

38. An electrophotographic imaging apparatus according to claim 37 wherein T_2 is H, the m value for X_2 is 0, Y_2 is a bond, Y_1 is $-CR_1=N-NR_2-$ where the C atom is
 25 connected to Ar and the terminal N atom is connected to X_1 , and T_1 comprises a thiiranyl group.

39. An electrophotographic imaging apparatus according to claim 38 wherein Ar comprises an arylamine group or an aromatic heterocyclic group.

40. An electrophotographic imaging apparatus according to claim 38 wherein R_2 comprises an aromatic group.

41. An electrophotographic imaging apparatus according to claim 40 wherein
5 the aromatic group of R_2 has the formula



where R_{12} comprises an arylamine group, R_{13} is a linking group comprising an alkyl group, an alkenyl group, or an aryl group, R_{14} comprises H, an alkyl group, an alkenyl group, or an aryl group, X_3 has the formula $-(CH_2)_m-$, branched or linear, where
10 m is an integer between 1 and 20, and T_3 is a thiiranyl group.

42. An electrophotographic imaging apparatus according to claim 37 wherein the m value for X_1 is 0, T_1 comprises an aromatic group, T_2 comprises a thiiranyl group, Y_2 is a bond, and Y_1 is $-CR_1=N-NR_2-$ where the C atom is connected to Ar and the
15 terminal N atom is connected directly to T_1 .

43. An electrophotographic imaging apparatus according to claim 42 wherein Ar comprises an arylamine group or an aromatic heterocyclic group.

20 44. An electrophotographic imaging apparatus according to claim 37 wherein T_2 is H, the m value for X_2 is 0, Y_2 is a bond, Y_1 is $-CR_3=N-N=CR_4-$, and T_1 comprises a thiiranyl group.

45. An electrophotographic imaging apparatus according to claim 44 wherein
25 Ar comprises an arylamine group or an aromatic heterocyclic group.

46. An electrophotographic imaging apparatus according to claim 37 wherein Y_1 and Y_2 are a bond and Ar comprises a bis[(N,N-disubstituted)amino]arylene group.

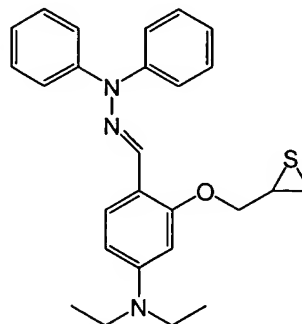
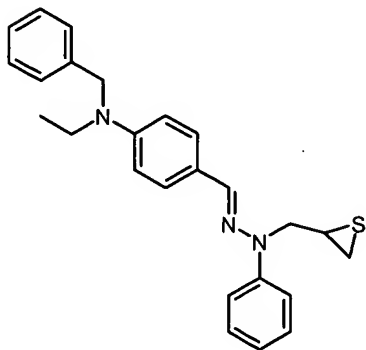
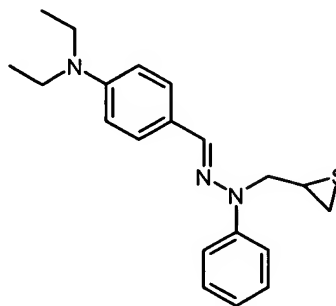
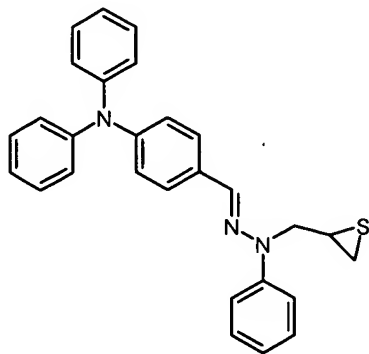
47. An organophotoreceptor according to claim 46 wherein T_2 is H, an alkyl group, an alkenyl group, or an aromatic group.

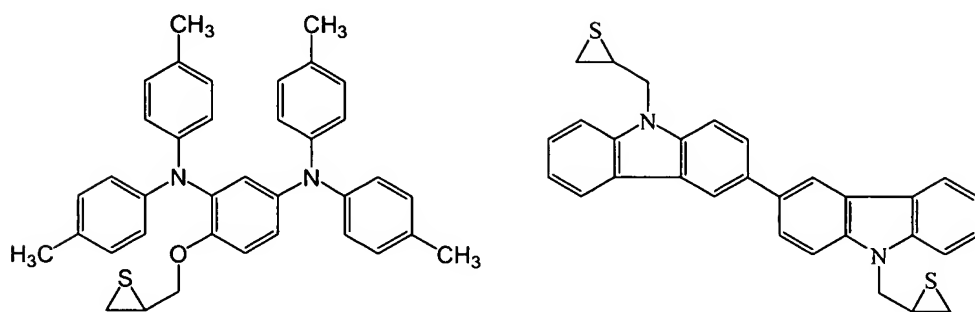
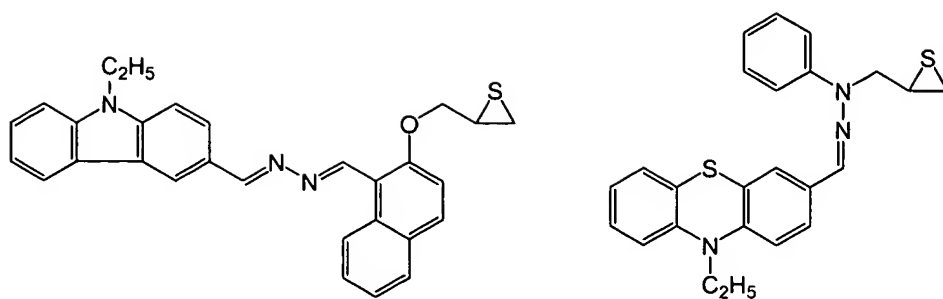
48. An electrophotographic imaging apparatus according to claim 37 wherein
5 Y_1 and Y_2 are a bond, Ar comprises two arylamine groups.

49. An electrophotographic imaging apparatus according to claim 48 wherein Ar is a bicarbazole group.

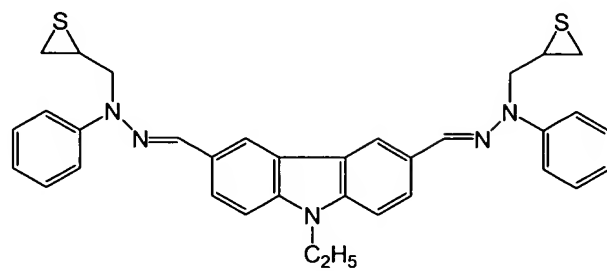
10 50. An electrophotographic imaging apparatus according to claim 37 wherein Ar comprises an arylamine group, Y_1 and Y_2 are each independently $-CR_1=N-NR_2-$, and T_1 and T_2 , each independently, comprise a thiiranyl group.

15 51. An electrophotographic imaging apparatus according to claim 37 wherein the charge transport material is selected from the group consisting of the following formulae:

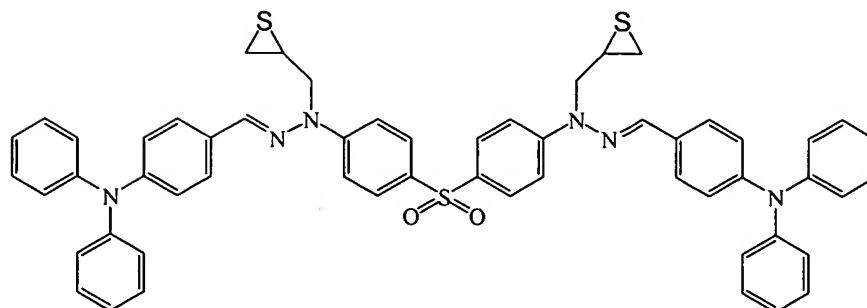




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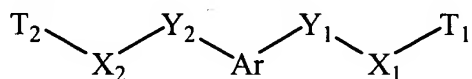
52. An electrophotographic imaging process according to claim 37 wherein the photoconductive element further comprises a second charge transport material.

53. An electrophotographic imaging process according to claim 52 wherein the second charge transport material comprises an electron transport compound.

54. An electrophotographic imaging process according to claim 37 wherein the photoconductive element further comprises a binder.

55. An electrophotographic imaging process according to claim 37 wherein the toner comprises a liquid toner comprising a dispersion of colorant particles in an organic liquid.

56. A charge transport material having the formula



where Y_1 and Y_2 are, each independently, a bond, $-CR_1=N-NR_2-$, or $-CR_3=N-N=CR_4-$ where R_1 , R_2 , R_3 , and R_4 comprise, each independently, H, an alkyl group, an alkenyl group, a heterocyclic group, or an aromatic group;

X_1 and X_2 are, each independently, a linking group having the formula $-(CH_2)_m-$, branched or linear, where m is an integer between 0 and 20, inclusive, and one or more of the methylene groups is optionally replaced by O, S, C=O, O=S=O, a heterocyclic group, an aromatic group, urethane, urea, an ester group, an NR_5 group, a CHR_6 group, or a CR_7R_8 group where R_5 , R_6 , R_7 , and R_8 comprise, each independently, H, hydroxyl group, thiol group, an alkyl group, an alkenyl group, a heterocyclic group, or an aromatic group;

T_1 and T_2 are, each independently, a thiiranyl group, H, an alkyl group, an alkenyl group, or an aromatic group with the proviso that at least one of T_1 and T_2 is a thiiranyl group; and

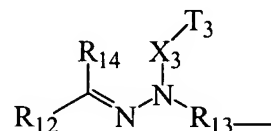
Ar comprises an aromatic group with the proviso that when both Y_1 and Y_2 are a bond and one of T_1 and T_2 is not a thiiranyl group, Ar comprises a bis[(N,N-disubstituted)amino]aromatic group or a bicarbazole group.

57. A charge transport material according to claim 56 wherein T_2 is H, the m value for X_2 is 0, Y_2 is a bond, Y_1 is $-\text{CR}_1=\text{N}-\text{NR}_2-$ where the C atom is connected to Ar and the terminal N atom is connected to X_1 , and T_1 comprises a thiiranyl group.

58. A charge transport material according to claim 57 wherein Ar comprises an arylamine group or an aromatic heterocyclic group.

59. A charge transport material according to claim 57 wherein R_2 comprises an aromatic group.

60. A charge transport material according to claim 59 wherein the aromatic group of R_2 has the formula



where R_{12} comprises an arylamine group, R_{13} is a linking group comprising an alkyl group, an alkenyl group, or an aryl group, R_{14} comprises H, an alkyl group, an alkenyl group, or an aryl group, X_3 has the formula $-(\text{CH}_2)_m-$, branched or linear, where m is an integer between 1 and 20, and T_3 is a thiiranyl group.

61. A charge transport material according to claim 56 wherein the m value for X_1 is 0, T_1 comprises an aromatic group, T_2 comprises a thiiranyl group, Y_2 is a bond, and Y_1 is $-\text{CR}_1=\text{N}-\text{NR}_2-$ where the C atom is connected to Ar and the terminal N atom is connected directly to T_1 .

62. A charge transport material according to claim 61 wherein Ar comprises an arylamine group or an aromatic heterocyclic group.

63. A charge transport material according to claim 56 wherein T_2 is H, the m value for X_2 is 0, Y_2 is a bond, Y_1 is $-\text{CR}_3=\text{N}-\text{N}=\text{CR}_4-$, and T_1 comprises a thiiranyl group.

64. A charge transport material according to claim 63 wherein Ar comprises an arylamine group or an aromatic heterocyclic group.

65. A charge transport material according to claim 56 wherein Y_1 and Y_2 are a bond and Ar comprises a bis[(N,N-disubstituted)amino]arylene group.

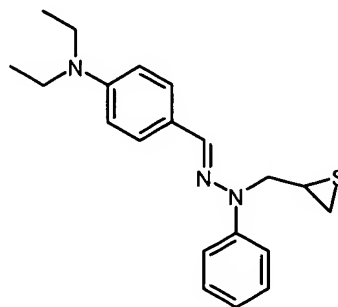
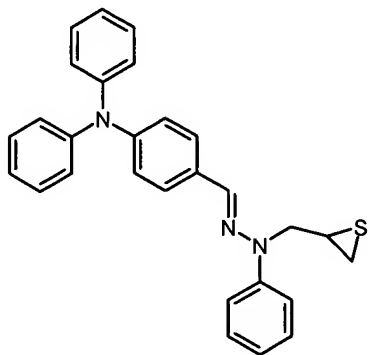
66. A charge transport material according to claim 65 wherein T_2 is H, an alkyl group, an alkenyl group, or an aromatic group.

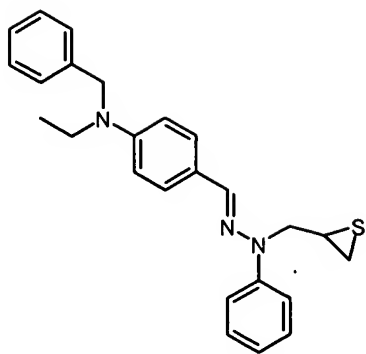
67. A charge transport material according to claim 56 wherein Y_1 and Y_2 are a bond, Ar comprises two arylamine groups.

68. A charge transport material according to claim 67 wherein Ar is a bicarbazole group.

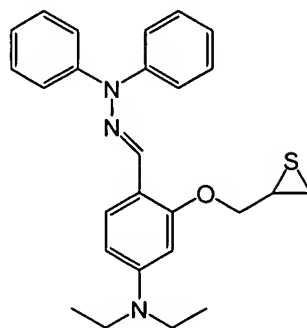
69. A charge transport material according to claim 56 wherein Ar comprises an arylamine group, Y_1 and Y_2 are each independently $-CR_1=N-NR_2-$, and T_1 and T_2 , each independently, comprise a thiiranyl group.

70. A charge transport material according to claim 56 wherein the charge transport material is selected from the group consisting of the following formulae:

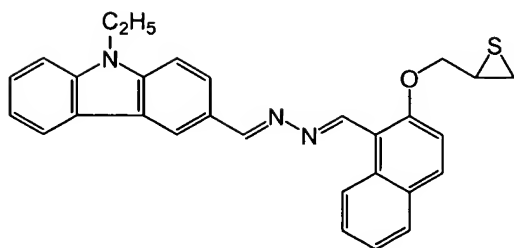




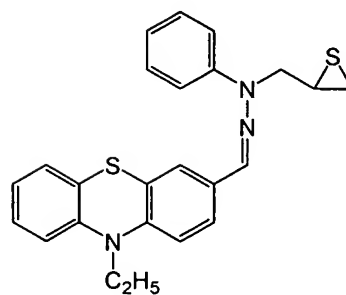
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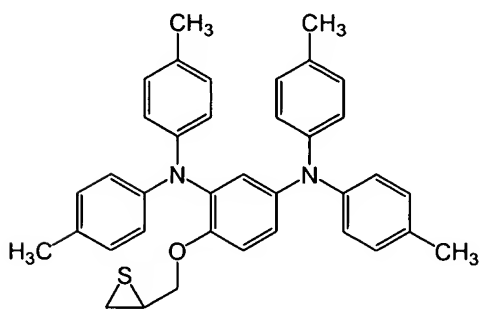


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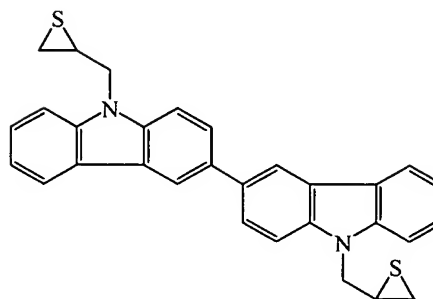


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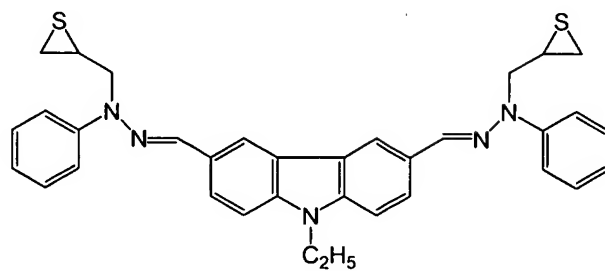
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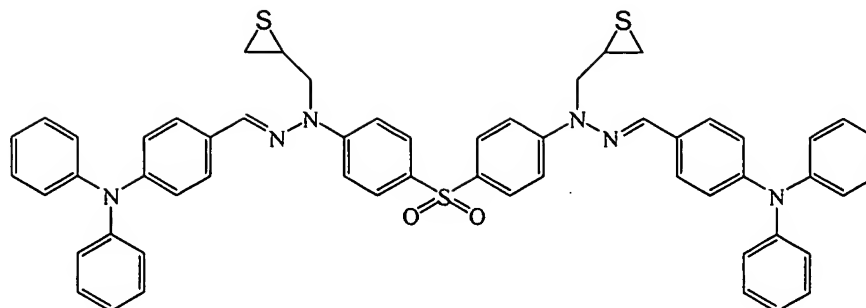


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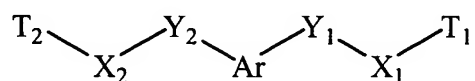


, and

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71. A polymeric charge transport material prepared by the reaction of a functional group in a polymeric binder with at least a thiiranyl group in a compound
5 having the formula



where Y_1 and Y_2 are, each independently, a bond, $-CR_1=N-NR_2-$, or $-CR_3=N-N=CR_4-$ where R_1 , R_2 , R_3 , and R_4 comprise, each independently, H, an alkyl group, an alkenyl group, a heterocyclic group, or an aromatic group;

10 X_1 and X_2 are, each independently, a linking group having the formula $-(CH_2)_m-$, branched or linear, where m is an integer between 0 and 20, inclusive, and one or more of the methylene groups is optionally replaced by O, S, C=O, O=S=O, a heterocyclic group, an aromatic group, urethane, urea, an ester group, an NR_5 group, a CHR_6 group, or a CR_7R_8 group where R_5 , R_6 , R_7 , and R_8 comprise, each independently, H, hydroxyl group,
15 thiol group, an alkyl group, an alkenyl group, a heterocyclic group, or an aromatic group;

T_1 and T_2 are, each independently, a thiiranyl group, H, an alkyl group, an alkenyl group, or an aromatic group with the proviso that at least one of T_1 and T_2 is a thiiranyl group; and

Ar comprises an aromatic group with the proviso that when both Y_1 and Y_2 are a
20 bond and one of T_1 and T_2 is not a thiiranyl group, Ar comprises a bis[(N,N-disubstituted)amino]aromatic group or a bicarbazole group.

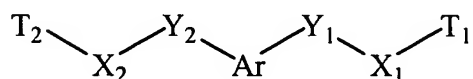
72. A polymeric charge transport material according to claim 71 wherein the functional group of the binder is selected from the group consisting of hydroxyl group,
25 carboxyl group, an amino group, and thiol group.

73. A polymeric charge transport material according to claim 71 wherein a crosslinking agent is bonded between the thiiranyl group and the functional group of the binder.

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74. An organophotoreceptor comprising an electrically conductive substrate and a photoconductive element on the electrically conductive substrate, the photoconductive element comprising:

(a) a polymeric charge transport compound prepared by the reaction of a functional group in a polymeric binder with at least a thiiranyl group in a compound having the formula



where Y_1 and Y_2 are, each independently, a bond, $-CR_1=N-NR_2-$, or $-CR_3=N-N=CR_4-$ where R_1 , R_2 , R_3 , and R_4 comprise, each independently, H, an alkyl group, an alkenyl group, a heterocyclic group, or an aromatic group;

X_1 and X_2 are, each independently, a linking group having the formula $-(CH_2)_m-$, branched or linear, where m is an integer between 0 and 20, inclusive, and one or more of the methylene groups is optionally replaced by O, S, C=O, O=S=O, a heterocyclic group, an aromatic group, urethane, urea, an ester group, an NR_5 group, a CHR_6 group, or a CR_7R_8 group where R_5 , R_6 , R_7 , and R_8 comprise, each independently, H, hydroxyl group, thiol group, an alkyl group, an alkenyl group, a heterocyclic group, or an aromatic group;

T_1 and T_2 are, each independently, a thiiranyl group, H, an alkyl group, an alkenyl group, or an aromatic group with the proviso that at least one of T_1 and T_2 is a thiiranyl group; and

Ar comprises an aromatic group with the proviso that when both Y_1 and Y_2 are a bond and one of T_1 and T_2 is not a thiiranyl group, Ar comprises a bis[(N,N-disubstituted)amino]arylene group or a bicarbazole group; and

(b) a charge generating compound.

75. An organophotoreceptor according to claim 74 wherein the photoconductive element further comprises an electron transport compound.

76. An organophotoreceptor according to claim 74 wherein the functional
5 group of the binder is selected from the group consisting of hydroxyl group, carboxyl group, an amino group, and thiol group.